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SYSTEMS AND METHODS FOR PROTECTING RETAIL DISPLAY MERCHANDISE FROM THEFT

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SYSTEMS AND METHODS FOR PROTECTING RETAIL DISPLAY MERCHANDISE FROM THEFT

FIELD OF THE INVENTION

[0001] The present invention relates to merchandise security, and, more particularly, to systems and methods for protecting retail display merchandise from theft.

BACKGROUND OF THE INVENTION

[0002] Displays for retail merchandise utilize different types of theft deterrent security systems and methods to discourage shoplifters. Many of these systems and methods include sensors and alarms. When the integrity of the display is compromised, such as by cutting or removing a cable that extends between the security system and the item of merchandise, or by separating the item of merchandise from the security system, an alarm is activated to alert store personnel of a potential theft situation.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] FIG. 1 is a schematic view depicting an exemplary embodiment of a security system in accordance with the present invention for protecting retail display merchandise from theft.

[0004] FIG. 2 is an enlarged plan view of an item of electronic merchandise configured for operation with the security system of FIG. 1.

[0005] FIG. 3 is a flowchart illustrating an exemplary embodiment of a system and method in accordance with the present invention for operating the security system of FIG. 1 with the item of electronic merchandise of FIG. 2.

[0006] FIG. 4 is a perspective view of another exemplary embodiment of a security system in accordance with the present invention for protecting retail display merchandise from theft configured for operation with an item of electronic merchandise.

[0007] FIG. 5 is an elevation view of the security system and the item of electronic merchandise of FIG. 4.

[0008] FIG. 6 is a flowchart illustrating another exemplary embodiment of a system and method in accordance with the present invention for operating the security system of FIG. 4 with the item of electronic merchandise.

[0009] FIG. 7 is a perspective view of another exemplary embodiment of a security system in accordance with the present invention for protecting retail display merchandise from theft configured for operation with an item of electronic merchandise.

[0010] FIG. 8 is a flowchart illustrating another exemplary embodiment of a system and method in accordance with the present invention for operating the security system of FIG. 7 with the item of electronic merchandise.

[0011] FIG. 9 is a flowchart illustrating another exemplary embodiment of a system and method in accordance with the present invention for operating one or more of the security systems of FIG. 7 with a security monitoring device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary and preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout, and prime notation and multiple prime notations are used to indicate similar elements in alternative embodiments.

[0013] Referring initially to FIGS. 1-3, in one embodiment a retail display security system 10 according to the invention is configured for operation with an item or article of electronic merchandise 20, which is illustratively shown herein as a mobile wireless communications device, and more specifically, a cellular telephone. The item of electronic merchandise 20 includes a portable (i.e. movable) housing 21 and a substrate 22, for example, a printed circuit board (PCB) comprising wireless communications circuitry that is carried by the housing. The substrate 22 may be a rigid PCB, or alternatively, may be a flexible substrate or flexible PCB. In some embodiments, the PCB may be replaced by or used in conjunction with a metal chassis or other structural substrate, as will be appreciated by those skilled in the art.

[0014] The wireless communications circuitry 23 carried by the housing 21 may include, for example, one or more wireless transceivers for transmitting and receiving cellular, WiFi, and/or Bluetooth communications. The item of electronic merchandise 20 also illustratively includes a

satellite positioning signal receiver 43, for example, a Global Positioning System (GPS) satellite receiver, as is known in the art. The item of electronic merchandise 20 further includes a display 24, and a plurality of input devices 25, illustratively keys, for accepting user inputs, as will also be appreciated by those skilled in the art. Input devices 25 may also be buttons or the like, or may be embodied by a touch screen, as is known in the art.

[0015] The item of electronic merchandise 20 also includes an orientation sensor 26 carried by the housing 21. The orientation sensor 26 may be a gyroscope, for example, and more particularly, may be a 3-axis gyroscope. The orientation sensor 26 may also be embodied by a digital compass, for example, as will be appreciated by those skilled in the art.

[0016] The item of electronic merchandise 20 also includes an output device 27. In particular embodiments, the output device 27 is an audio output transducer, or speaker. The output device 27 may be another type of audio output device and other output devices may also be used, for example, a haptic output device or a visual output device, alone or in combination with an audio output device.

[0017] In the illustrated embodiments, the item of electronic merchandise 20 also includes an accelerometer 31 carried by the housing 21. The accelerometer 31 may be a multi-axis accelerometer, or alternatively, the item of electronic merchandise 20 may include multiple directional accelerometers.

[0018] The item of electronic merchandise 20 also includes a battery pack 32 that is likewise carried by the housing 21. The battery pack 32 includes battery management circuitry 33, such as power management circuitry, and one or more battery cells 34 operably coupled to the power management circuitry. The battery cells 34 may be rechargeable battery cells, such as a nickel-metal hydride or lithium ion battery cells. In some embodiments, the battery cells 34 may be replaced by or used in conjunction with another power source, such as a fuel cell, as will be appreciated by those skilled in the art. When not operating in conjunction with the retail display security system 10 of the present invention, the item of electronic merchandise 20 may be powered by an external power source through a conventional power cord or charger.

[0019] The item of electronic merchandise 20 also includes a controller 35 carried by the housing 21 and operably coupled to the wireless communications circuitry 23, the accelerometer 31, the orientation sensor 26, and the output device 27. The controller 35 advantageously cooperates with the wireless communications circuitry 23 to coordinate and control operations of

the item of electronic merchandise 20, namely wireless communications functions and capabilities of the cellular telephone. Operations may include mobile voice and data operations, including email and Internet data, for example.

[0020] The controller 35 cooperates with the orientation sensor 26 to determine a reference direction of the item of electronic merchandise 20. For example, when the electronic merchandise 20 is held by a potential purchaser 36 in an operational position with the display 24 and input devices 25 facing the customer, the orientation sensor 26 may cooperate with the controller 35 to determine the direction that the customer and the electronic merchandise are facing, for example, North (FIG. 1). The controller 35 also cooperates with the accelerometer 31 to measure and monitor an acceleration of the item of electronic merchandise 20.

[0021] According to one embodiment, based upon the orientation and measured accelerations of the item of electronic merchandise 20, as well as the elapsed time of any movements of the electronic merchandise, the controller 35 determines a distance from a given location, such as a designated retail display “home” position. The “home” position may, for example, be established by the item of electronic merchandise 20 being in contact with or in close proximity to a holder, platform or the like, generically referred to herein as a cradle 37. Cradle 37 may stand alone, or alternatively, may be permanently attached to, removably attached to, or otherwise operably coupled with a display stand, alarm module, base or the like 38. More particularly, the controller 35 may be programmed directly, for example, via the input devices 25, or alternatively, may be programmed indirectly by an external system or device, so that the location of the cradle 37 is the “home” position of the item of electronic merchandise 20. The controller 35 may determine the distance the item of electronic merchandise 20 is moved from the “home” position (e.g. cradle 37), when the item of merchandise is removed from the “home” position by a customer considering whether to purchase the merchandise. As used herein, the term “distance traveled” refers to the absolute value of the radial distance that the item of electronic merchandise 20 is moved away from the “home” position. In particular examples, the controller 35 utilizes conventional motion processing algorithms to determine the distance traveled by the item of electronic merchandise 20 away from the “home” position.

[0022] It should be noted that the “home” position need not be the same location each time. Additionally, or alternatively, there may be more than one “home” position. For example a “home” position may be a battery charging station or any number of a plurality of “power

hotspots,” such as inductive power transfer charging stations. Alternatively, or additionally, the “home” position may be a location at which the item of electronic merchandise 20 remains motionless for a period of time and the wireless communications circuitry 23 indicates a minimum threshold power signal. In other words, a “home” position may be established when the item of electronic merchandise is motionless and charging for a predetermined period of time. Alternatively, or in conjunction with establishing one or more “home” positions, the controller 35 may use one or more motion sensors and motion processing algorithms to establish (i.e. map) a “safe” zone (also boundary, perimeter or area) with or without reference to one or more “home” positions. The controller can then determine, based on subsequent motion processing, whether an item of merchandise is moved from a location within the “safe” zone to a location outside or beyond the established “safe” zone.

[0023] In particular embodiments, the controller 35 determines the distance traveled from the “home” position based upon inertial navigation system (INS) techniques, for example, dead reckoning, as will be appreciated by those skilled in the art. As such, in this example embodiment, no external references, for example, a GPS determined position or RF communication, are required to determine the distance traveled by the item of electronic merchandise 20 from the “home” position. As a result, the security system 10 configured for operation with an item of electronic merchandise 20 in accordance with this embodiment of the invention is particularly advantageous for use in an indoor environment, for example, a display area of a retail store, where a GPS position cannot always be determined and where RF communications can be obstructed. However, it is understood that in other embodiments discussed herein, external references may be employed.

[0024] The item of electronic merchandise 20 illustratively includes a memory 41 for storing computer-executable instructions and data for processing. The controller 35 may cooperate with the computer-executable instructions in the memory 41, for example, an algorithm embodied in a software application, to perform the functions described herein. As will be appreciated by those skilled in the art, the controller 35 may be embodied as a hardware component or as a combination of hardware and application software.

[0025] Based upon the distance traveled by the item of electronic merchandise 20 from the cradle 37, the controller 35 may determine whether the distance traveled exceeds at least one threshold distance. For example, the controller 35 may determine whether the item of electronic

merchandise 20 has been moved more than ten feet in any radial direction from the cradle 37. Of course, the threshold distance may be set to any desired distance, or alternatively, to another variable, such as time, acceleration, orientation, etc. In particular, the threshold variable may be set to any desired value of any suitable variable via programming using the input devices 25, or wirelessly via the wireless communications circuitry 23. Alternatively, the memory 41 of the item of merchandise 20 may be pre-programmed with one or more predetermined threshold variables and/or values.

[0026] Regardless, when the threshold distance has been exceeded the controller 35 activates the output device 27 with a visual, an audible or haptic alarm. For example, the alarm may be an audible voice message requesting that the item of electronic merchandise 20 be returned to the cradle 37 within a limited period of time. The voice message may be customizable in that it may be set to be a male or female voice, and/or may be set to speak in a predetermined language or to speak in one or more of multiple languages. The controller 35 alternatively or additionally may activate other output devices 27, for example, a haptic (e.g. vibration) device or a visual (e.g. flashing LED) device.

[0027] In particular embodiments, there may be more than one threshold, for example a first threshold and a second threshold. When the controller 35 determines that a first threshold distance has been exceeded, the controller may activate an initial “warning” via the output device 27. The warning may be a voice, as noted above, and may indicate for example that unless the item of electronic merchandise 20 is returned to the “home” position or is brought back within the first threshold distance, an alarm will be activated.

[0028] If the item of electronic merchandise 20 is not timely returned to the “home” location or to a location within the first threshold distance, and instead, the second threshold distance is exceeded, the controller 35 may activate a subsequent alarm, such as an audible siren, via the output device 27. As previously mentioned, a time-based threshold may also be used alone or in combination with one or more distance-based thresholds. If the controller 35 activates an alarm indication, the controller may advantageously cooperate with the wireless communications circuitry 23 to transmit the location of the item of electronic merchandise 20 to another component of the security system or device. For example, if the item of electronic merchandise 20 is removed from the display area of the retail store to a location where GPS reception is possible, the controller 35 may transmit GPS coordinates via the wireless communication

circuitry 23 to a remote server or central monitoring station based upon the satellite positioning signal receiver 43. The controller 35 may also cooperate with the wireless communications circuitry 23 to call a telephone number and/or send an email or text message to security or “loss prevention” personnel. In particular embodiments, if the item of electronic merchandise 20 includes a camera or camcorder, the controller 35 may activate the camera to take still photographs and/or activate the camcorder to record video footage. Regardless, the controller 35 may then further cooperate with the wireless communications circuitry 23 to transmit the video data to security or “loss prevention” personnel to be used to identify an alleged shoplifter.

[0029] Still further, the controller 35 may cooperate with the wireless communications circuitry 23 to wirelessly transmit instructions to activate another output device 27, such as a store alarm remote from the item of electronic merchandise 20 and the display area. As will be appreciated by those skilled in the art, the controller 35 may cooperate with the wireless communications circuitry 23 to likewise communicate instructions to other security systems and/or devices to perform additional operations. In one advantageous example, the controller 35 may cooperate with the wireless communications circuitry 23 to instruct adjacent cradles 37 supporting other items of merchandise to enter a “lockdown mode” so that the other items of merchandise supported thereon cannot be removed and stolen. Lockdown may be achieved by mechanical, magnetic, electrical, electromechanical or electromagnetic locks, as will be understood by those skilled in the art.

[0030] Moreover, in some embodiments, the controller 35 may determine whether the location of the item of electronic merchandise 20 is within a given geographical area based upon the distance traveled as determined by the movements of the merchandise. The controller 35 may cooperate with the wireless communications circuitry 23 to wirelessly transmit instructions to perform a further function based upon this distance. For example, the controller 35 may cooperate with the wireless communications circuitry 23 to send instructions to activate a remote audio and/or video presentation terminal when the user is adjacent the remote terminal. The remote terminal may provide sales or technical product information to the user related to the item of electronic merchandise 20, for example. The controller 35 may cooperate with the wireless communications circuitry 23 to transmit other instructions based upon a position, location, orientation or distance from a reference location of the merchandise 20, as will be appreciated by those skilled in the art. In other embodiments, the controller 35 may simply be configured to

transmit instructions and/or activate the output device 27 based on a communication failure, such as a failure to receive a signal from an external reference.

[0031] The controller 35 may deactivate the output device 27 upon the item of electronic merchandise 20 being returned (i.e. moved back) within the first or second threshold distance, for example. Alternatively or additionally, the controller 35 may disable the output device 27 based upon an input from the input devices 25, for example, a security code entered via a keypad. The controller 35 may also deactivate the output device 27 wirelessly via the wireless communications circuitry 23, or via a key, such as a mechanical, magnetic, electrical, optical or infrared key fob device. Of course, the controller 35 may perform additional and/or other communications functions upon an alarm condition, as will be appreciated by those skilled in the art, including for example, disabling one or more functions, capabilities or operations of the merchandise 20.

[0032] A further sensor 42 may be carried by the housing 21 adjacent the battery packs 32 and coupled to the controller 35. The controller 35, based upon an unauthorized entry into the housing 21, such as an attempted access to the battery pack 32 through the battery door, may activate an alarm from the output device 27. The further sensor 42 may be any type of sensor, for example, a magnetic sensor, an optical sensor, a pressure or limit switch, or a contact switch. Activation of the alarm may advantageously indicate an unauthorized attempt to remove the battery pack 32 in an effort to disable the security system 10, and thereby provide an increased time for a response from security personnel. The controller 35 may perform other actions, for example, communications via the wireless communications circuitry 23 as previously described, based upon input from the further sensor 42.

[0033] The security system 10 configured for operation with the item of electronic merchandise 20 may advantageously be calibrated when it is placed on the cradle 37 at the “home” position in the display area. More particularly, the controller 35 of the item of electronic merchandise 20 may receive a wireless signal or other signal from the cradle 37 indicating that the location of the cradle is the desired “home” position. Since position errors may accumulate each time the item of electronic merchandise 20 is moved, the security system 10 and/or the cradle 37 may be equipped with a suitable sensor and associated circuitry to reset the “home” position when the item of electronic merchandise 20 is supported on the cradle. In a particular embodiment, the cradle 37 is a charging station and the controller 35 resets the “home” position of the item of

electronic merchandise 20 based upon the merchandise being in a motionless state for a predetermined period of time and/or being charged by the charging station. Alternatively, or in addition, other continuous or periodic calibration techniques applicable to inertial navigation systems, inertial guidance units and the like may be used.

[0034] Referring now to FIGS. 4-6, another exemplary embodiment of a security system 10' according to the present invention is configured for operation with an item of merchandise 20' that includes a housing 21' having a display 24' and input devices 25' carried by the housing. In addition, an externally mounted security module 50' is secured to the item of merchandise 20'. The security module 50' includes its own housing 51' that carries an orientation sensor 26' and accelerometer 31'. The security module 50' also includes an output device 27', and may optionally include wireless communications circuitry 23', for example, NFC, Bluetooth or other protocol communications circuitry. A power source 32', for example an internal battery pack, is also carried by the housing 51' to provide power to a controller 35' and related circuitry, as will be appreciated by those skilled in the art. In one embodiment, the security module 50' is attached to the cradle 37 with a tether or cable, which would be a mechanical tether or a tether having one or more conductors for defining a detectable sense loop for detecting disconnection or cutting of the tether.

[0035] An adhesive layer 44' (FIG. 5) may be used to mount or attach the housing 51' of the security module 50' to the housing 21' of the item of merchandise 20'. For example, the adhesive layer 44' may be a pressure sensitive adhesive (PSA). Other types of adhesives may be used, and other mounting or attachment elements may be used, such as interlocking features, magnetically attractive strips, etc. as will be appreciated by those skilled in the art. The temporary (i.e. releasable) coupling permits the security module 50' to be installed for retail display and subsequently removed upon sale of the item of merchandise 20' or in order to reuse the security module 50' with a different item of merchandise.

[0036] The above-noted components are operably coupled to the controller 35' that is carried within the housing 51'. The controller 35' is advantageously configured to operate similarly to the embodiment of the security system 10 configured for operation with the item of electronic merchandise 20 described above with respect to FIGS. 1-3. In other words, the security module 50' with controller 35' is a stand-alone security system 10' that may be externally mounted or attached to a housing 21' of the item of merchandise 20', or to any other high value merchandise.

It should be noted that since the security module 50' is a stand-alone security system, the item of merchandise 20' need not be an electronic item of merchandise. For example, the item of merchandise 20' may be an article of jewelry, an article of clothing, an item of pre-recorded media (e.g. CD, DVD, etc.) or the like. Alternatively or additionally, the item of merchandise 20' may include electronics, such as the cellular telephone illustratively shown herein with respect to the exemplary embodiments of the invention.

[0037] The security module 50' may also include a further sensor 42', for example, a mechanical limit or pressure sensor, that may be operably coupled to the controller 35'. The further sensor 42' may be configured to sense a separation between the housing 51' and the housing 21' that would occur if the security module 50' is removed (detached) from the item of merchandise 20'. Other sensors may cooperate with the controller 35' to sense tampering with the security module 50', for example, an electrical sensor, optical (i.e. light) sensor, or a magnetic sensor. Regardless, the controller 35' may be operable to activate an alarm based on an indicated state of the further sensor 42', as previously described.

[0038] The security module 50' may be used to protect an item of merchandise 20' that does not include wireless communications circuitry, an accelerometer, and/or a gyroscope, for example, a stand-alone camera or a stand-alone portable media player, electronic reader or the like. In other words, the security module 50' may be considered an "add-on" to the item of merchandise 20'. However, if the item of merchandise 20' includes wireless communications circuitry, the wireless communications circuitry 23' of the security module 50' may communicate with the wireless communications circuitry of the item of merchandise to control operation thereof, such as to shut off the item of merchandise or to restrict (disable) its operation. At least some of the above-noted components, for example, the output device 27' may be carried by the housing 21' of the item of merchandise 20' in further embodiments.

[0039] In an embodiment, the security module 50' is an external sensor that is temporarily attached, for example via a pressure sensitive adhesive (PSA), to an item of merchandise 20' and is removably positioned or supported on a display stand, alarm module, base or the like 38 having battery charging capability. Preferably, both the sensor 50' and the base 38 have wireless "qi" compliant battery charging capability that incorporates magnetic inductive coils to transfer electrical power from the base to the sensor in a known manner. Furthermore, the base 38 and/or the sensor 50' include voltage regulator electronics and circuitry for providing a proper charging

and/or operating voltage to an electronic item of merchandise 20' attached to the sensor. For example, the base 38 and/or the sensor 50' may include electronics and circuitry for identifying an electronic item of merchandise 20' and its charging and operating power requirements. Consequently, the base 38 is operable to provide electrical power to the sensor 50' and/or an electronic item of merchandise 20' attached to the sensor when the sensor is positioned or supported on the base.

[0040] Regardless, the sensor 50' operates in the manner previously described to determine a distance travelled by the item of merchandise 20' away from a retail display "home" position 37' (i.e. base 38) and to activate an output device 27' in the event that the distance travelled from the base 38 exceeds a threshold distance. In a particular embodiment, the wireless communications circuitry 23' of the sensor 50' communicates with wireless communications circuitry disposed within the base 38 to activate an additional output device, such as a visual indicator (e.g. LED) or an audio alarm, at the "home" location and/or a remote location. As such, the orientation sensor 26' and the accelerometer 31' previously described may be carried by the base 38 instead of the sensor 50'. Furthermore, the sensor 50' and/or the base 38 may be provided with a communications port for programming as well as for enabling and subsequently disabling the security system 10'. In still other embodiments, the base 38 may be configured via the wireless "qi" compliant battery charging capability to automatically determine the charging and/or operating power requirements for another electronic item of merchandise 20' attached to a different sensor 50' in the event that the different sensor is inadvertently positioned or supported on the base.

[0041] Referring now to FIGS. 7-8, yet another exemplary embodiment of a security system 10'' according to the present invention is configured for operation with an item of electronic merchandise 20''. The security system 10'' is embodied in the form of a display battery pack 55''. The display battery pack 55'' includes a housing 56'' that is sized to be disposed within the housing 21'' of the item of electronic merchandise 20'' in place of the service battery pack. In other words, the display battery pack 55'' has the same size and shape (planform) as the service battery pack normally provided for the item of electronic merchandise 20''. As such, the display battery pack 55'' may be inserted into the battery compartment of the item of electronic merchandise 20'' to temporarily replace the standard service battery pack. Thus, the display battery pack 55'' may be integrated with the item of electronic merchandise 20''.

[0042] Similar to the embodiments of the security system described above with respect to FIGS. 1-3 and FIGS. 4-6, the display battery pack 55” also includes an orientation sensor 26” carried by the housing 56” and an accelerometer 31” also carried by the housing 56”. The display battery pack 55” also includes an output device 27”, and may also optionally include wireless communications circuitry 23”, for example, Bluetooth or other protocol communications circuitry. A reduced power source 32” (e.g. battery cell 34”) and related battery circuitry 33”, is also carried by the housing 56” to power the controller 35” and other components of the display battery pack 55”, as will be appreciated by those skilled in the art. However, the configuration of the battery cell 34” is physically more compact than a standard-sized battery cell typically provided with the service battery pack for the item of electronic merchandise 20”, since the above-noted electronic components of the display battery pack 55” also require space within the housing 56”.

[0043] The display battery pack 55” may be configured to be charged inductively or capacitively from a charging station (not shown), which may be the “home” position, as previously described. For example, the display battery pack 55” may include the standardized Wireless Power Consortium’s “qi” compliant charging capabilities. Alternatively, the display battery pack 55” may be compliant with other charging standards or may be operable for charging via a proprietary charging protocol. Advantageously, the display battery pack 55” being “qi” compliant does not require the item of electronic merchandise 20” itself to be “qi” compliant, and further, requires no additional hardware on the item of electronic merchandise 20” for charging in the retail display environment (e.g. a power adapter cable). Of course, the display battery pack 55” may be charged using any other charging method without departing for the intended scope of the security systems and methods of the present invention. Regardless, the above mentioned components are operably coupled to the controller 35” that is carried within the housing 56”. The controller 35” is advantageously configured to operate similarly to the embodiments described above with respect to FIGS. 1-3 and FIGS. 4-6.

[0044] The display battery pack 55” is also particularly advantageous for protecting an item of electronic merchandise 20” that does not include wireless communications circuitry, an accelerometer, and/or a gyroscope, for example a conventional camera, portable media player, electronic reader or the like. Advantageously, the display battery pack 55” does not increase the

size or footprint of the item of electronic merchandise 20", and furthermore, does not protrude or extend outwardly from the housing 21" of the electronic merchandise.

[0045] Moreover, if the item of electronic merchandise 20" includes wireless communications circuitry, the wireless communications circuitry 23" of the display battery pack 55" may communicate with the wireless communications circuitry of the electronic merchandise to control operation thereof, for example, to shut-off the item of electronic merchandise or to restrict (i.e. disable) its operation. At least some of the above-noted components, for example, the output device 27" may be carried by the housing 21" of the item of electronic merchandise 20".

[0046] A further sensor 42", such as, for example, a mechanical limit or pressure sensor, or other sensor or sensors (e.g. electrical, magnetic, optical, etc.) may cooperate with the controller 35" to determine when the battery compartment door of the housing 21" is being opened. This may be indicative of tampering, or more particularly, an attempt to remove the display battery pack 55". Based upon the sensor detecting an unsecured state or condition, the controller 35" may activate an alarm and/or communicate, via the wireless communications circuitry 23", to control or disable the item of electronic merchandise 20". In addition, the display battery pack 55" may be more securely retained within the battery compartment of the housing 21" of the item of electronic merchandise 20" with an attachment element, such as an adhesive, anchors or functionally similar hardware, or a press fit. Securely retaining the display battery pack 55" may advantageously increase the amount of time required for a potential thief to remove the display battery pack from the item of electronic merchandise 20".

[0047] While the security system described above with respect to FIGS. 7-8 may be in the form of a display battery pack 55", it will be appreciated by those skilled in the art that the same functionality and components of the display battery pack may be embodied in any form factor. For example, the security system may be embodied in the form of a secure-digital (SD) memory card or subscriber identity module (SIM) card that is coupled with a camcorder, camera, electronic reader, personal computer, tablet or other item of electronic merchandise. Furthermore, the security system may take other forms where it is embodied in a replacement module or component for an existing module or component of an item of merchandise.

[0048] FIG. 9 illustrates an exemplary embodiment of a system and method 100" according to the present invention for operating one or more of the security modules 50' and/or display

battery packs 55a"-55d" with a security monitoring device 60". As shown, the security monitoring device 60" includes a controller 61" and wireless communications circuitry 62" coupled to the controller 61" of the security monitoring device. Advantageously, the security monitoring device 60" is paired, for example, by wireless communication (e.g. Bluetooth, RF, etc.), with each of the security modules 50' and/or display battery packs 55a"-55d". As such, each of the security modules 50' and/or display battery pack 55a"-55d" communicates, via its respective wireless communications circuitry 23", with the security monitoring device 60" via its wireless communications circuitry 62". In some cases, each of the security modules 50' and/or display battery pack 55a"-55d" is paired with the security monitoring device 60" by way of wireless communications. The security monitoring device 60", via its controller 61", monitors communications to each of the security modules 50' and/or display battery packs 55a"-55d", for example, for an indication that each security system 10" is active.

[0049] The security monitoring device 60" may be conceptually thought of as a "watch tower." If the security monitoring device 60" detects, for example, via a received "distress" signal from a the security modules 50' and/or display battery pack 55a"-55d", or determines that communication with a security system has been lost (i.e. decoupled or de-linked), the security monitoring device's controller 61" may activate an output device 63" indicative of an unsecured state or condition, for example, an audio, visual, and/or haptic alarm. The controller 61" may also communicate, via the wireless communications circuitry 62", to each of the security modules 50' and/or display battery pack 55a"-55d" to activate a respective output device 27', 27" (i.e. a dual alarm condition) so that security personnel are able to identify the security module 50' or display battery pack 55" of a particular item of electronic merchandise 20" communicating a distress signal. The security monitoring device 60" may also be activated based upon any of the further sensors described above, or manually, as will be appreciated by those skilled in the art. Moreover, the security monitoring device 60" may also include charging circuitry 64" coupled to the controller 61" and configured to function as a charger for the security modules 50' and/or display battery packs 55a"-55d", and may be "qi" compliant as described above.

[0050] While the security modules 50' and display battery packs 55" have been described as being used with the security monitoring device 60", it will be appreciated that the security monitoring device 60" may be used in conjunction with any of the above exemplary

embodiments of security systems according to the present invention. In particular, the security monitoring device 60” may be used in conjunction with a retail display cradle 37”, as previously described, and may likewise define a “home” position for an item of electronic merchandise 20”. In another exemplary embodiment, the security monitoring device 60” is paired to a security system according to the present invention by a wireless communication link (e.g. Bluetooth; RF; etc.) and acts as a “watch tower” with a “dead man’s switch” to activate an alarm at the security monitoring device and/or deactivate the electronic merchandise 20” based upon a failure to receive a return signal from the security system or if the security modules and/or display battery packs lose communication with the security monitoring device. Alternatively or additionally, the security monitoring device 60” may activate an alarm at a remote location or transmit a security signal (e.g. send a text or email notification) to security personnel, as previously described. In some embodiments, the security monitoring device 60” is integrated or otherwise part of a cradle 37.

[0051] Additionally, it will be appreciated by those skilled in the art that any of the above-described exemplary embodiments may be used either alone or in conjunction with one another to provide a “multi-layered” security system that provides increased overall security. For example, as a “first layer,” the controller of an item of electronic merchandise may cooperate with the memory of the merchandise to provide increased security as described above with respect to FIGS. 1-3. The same item of electronic merchandise may also include, as a “second layer,” a display battery pack, as described with respect to FIGS. 7-8. As a “third layer,” the security monitoring device (e.g., watch tower) may also be used with wireless communications circuitry in the manner described with respect to FIG. 9.

[0052] A related method according to the present invention is provided for protecting a retail display item of electronic merchandise to be evaluated and operated by a customer when considering whether to purchase the merchandise. As described above, the item of electronic merchandise includes a portable housing, at least one sensor carried by the portable housing, at least one output device carried by the portable housing, and a controller carried by the portable housing and coupled to the at least one sensor and to the at least one output device. The method may include determining a distance, for example an absolute radial distance, traveled by the item of electronic merchandise from a retail display “home” position using the controller and the at least one sensor. The method may further include using the controller to activate the at least one

output device based upon the distance traveled by the item of electronic merchandise from the “home” position exceeding at least one threshold distance.

[0053] In another embodiment, an electronic device 20, 20', or 20'' communicates with a security device, such as a security monitoring device 60'' discussed above, to determine if a signal is present during a particular time or procedure. In some instances, the electronic device 20 is configured to execute a boot procedure upon booting, such as restarting or powering up the device. During the boot procedure, the electronic device 20 is configured to check for the presence of a signal with the security device in order to continue to boot. This signal could be wireless (e.g., RF signal) or wired (e.g., via a port on the electronic device 20 such as a power port). In some cases, the signal may be a digital or an analog signal such as a resistor circuit. If the electronic device 20 does not receive the signal during the boot procedure, the electronic device aborts booting and powers off. In some embodiments, the electronic device 20 may disable itself if a signal is not received from the security device or communication otherwise fails during the boot procedure.

[0054] According to some embodiments utilizing the aforementioned boot procedure, a phone manufacturer is able to make a demo electronic device 20 useless to a thief if stolen. The electronic device 20 will only boot when communicating with the security device, which could be positioned remotely from the electronic device (e.g., within a display cabinet or otherwise out of sight of the consumer). Even if a thief successfully steals the electronic device 20, the electronic device will shut down or be disabled the first time the electronic device is rebooted. In some embodiments, the boot procedure may be a setting provided by the manufacturer of the electronic device 20. An authorized user could go into the settings of the electronic device 20 and either activate or deactivate a security switch or setting that would enable or disable communication with a security device. The electronic device 20 would then check for a signal communicated by the security device. If a signal is present, the electronic device 20 would go into a security mode whereby a boot procedure would be subsequently executed. Once the security mode has been activated, a password, key, or like authorization could be used to disable the security mode so that a thief cannot simply disable the security while the electronic device 20 is still connected to the security device.

[0055] In one embodiment, a security system employs Mobile Device Management (MDM) and/or Enterprise Mobility Management (EMM) platforms to secure items of merchandise in

retail or commercial installations from theft, tampering, or unauthorized access, as well as to manage content and function of the items. In this embodiment, the security system may include an item of merchandise according to any of the aforementioned embodiments, including embodiments where the item of merchandise has an external sensor, security module, or battery pack, as well as the embodiments where the item of merchandise leverages its own internal capabilities such that no external hardware is required for the item of merchandise.

[0056] It should be noted that the operations in instructions executed by the controller for any of the exemplary embodiments disclosed herein may be provided by a computer-program product, computer-readable medium, memory, or other storage medium. Many modifications and other embodiments of the invention will be readily apparent to one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is understood and appreciated that the invention is not to be limited to the specific exemplary embodiments disclosed herein, and that modifications to the disclosed embodiments and other undisclosed embodiments are intended to be included within the scope of the appended claims.

THAT WHICH IS CLAIMED IS:

1. A security system for retail display, the security system comprising:
a mobile device comprising:
a memory storing computer-executable instructions;
a controller; and
communication circuitry;
a security device configured to communicate with the communication circuitry,
wherein the computer-executable instructions are configured to execute a boot procedure upon booting the mobile device and to cause the controller to abort the boot procedure in response to the wireless security device failing to communicate with the communication circuitry during the boot procedure.
2. The security system of Claim 1, wherein the security device is configured to wirelessly communicate with the communication circuitry.
3. The security system of Claim 1, wherein the computer-executable instructions comprise a software application.
4. The security system of Claim 1, wherein the security device is located remotely from the mobile device.

ABSTRACT

Embodiments of the present invention are directed towards methods and systems for protecting items of merchandise from theft. In one example, a security system includes a mobile device comprising a memory storing computer-executable instructions, a controller, and communication circuitry. The security system also includes a security device configured to communicate with the communication circuitry. The computer-executable instructions are configured to execute a boot procedure upon booting the mobile device and to cause the controller to abort the boot procedure in response to the wireless security device failing to communicate with the communication circuitry during the boot procedure.

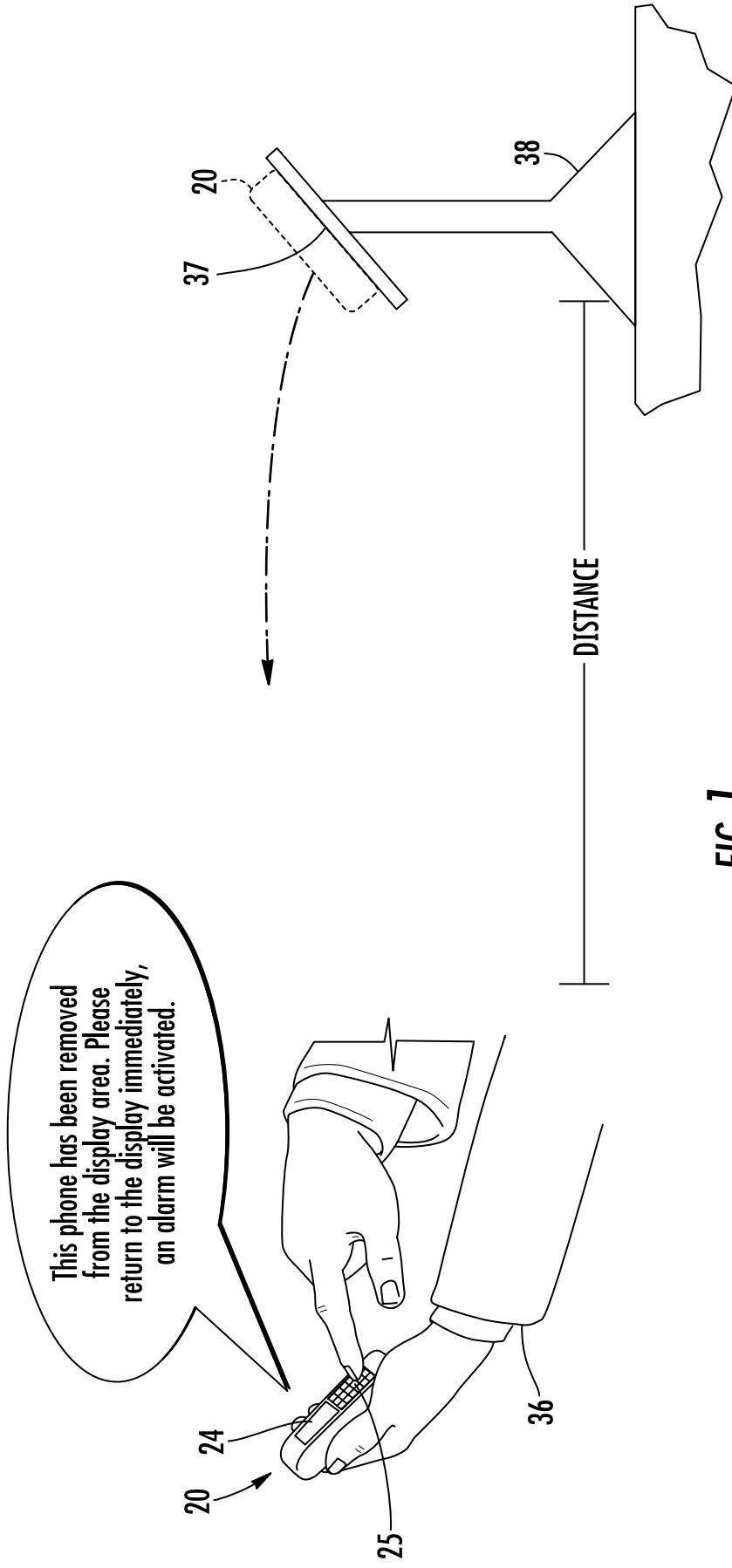
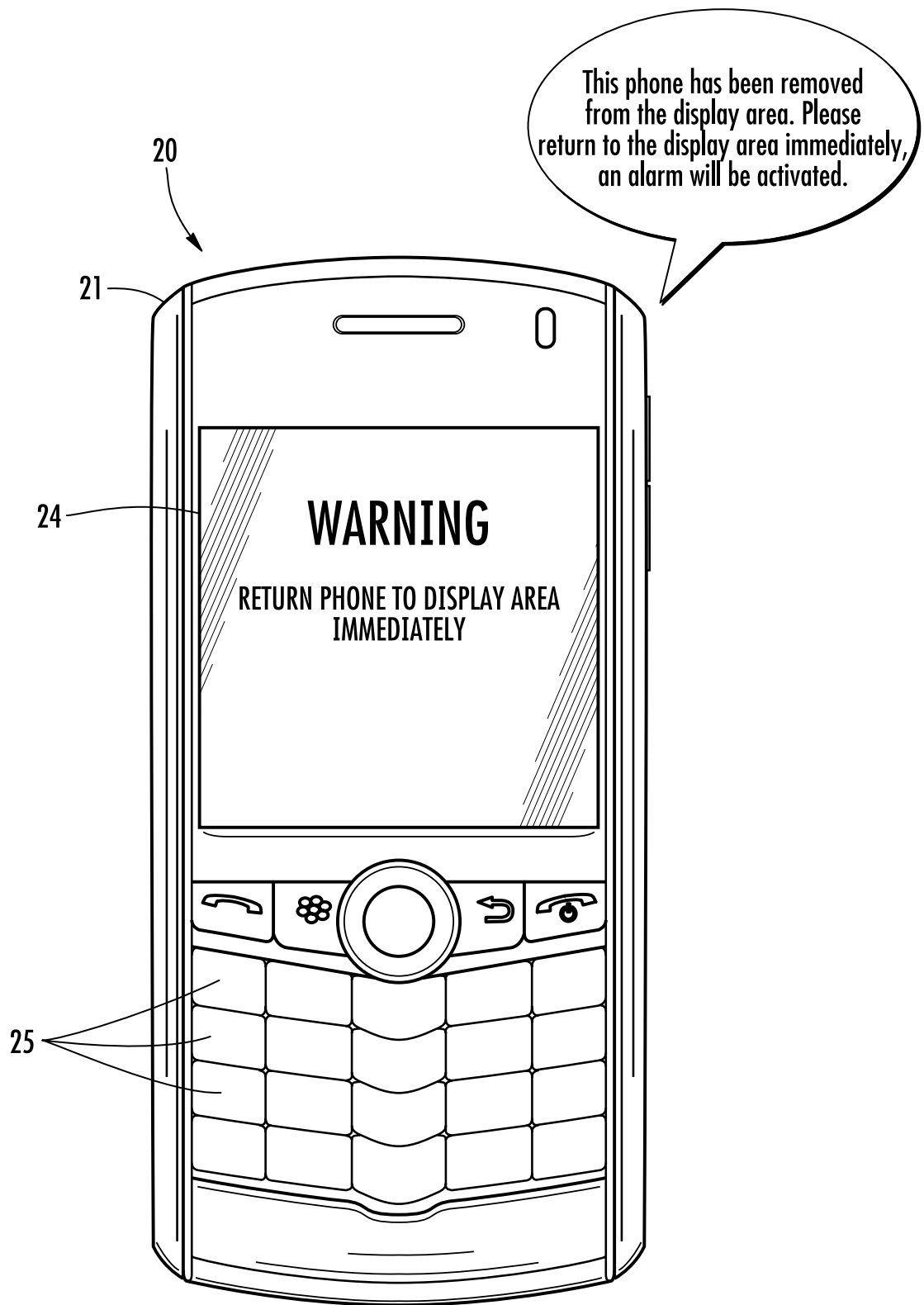


FIG. 1

**FIG. 2**

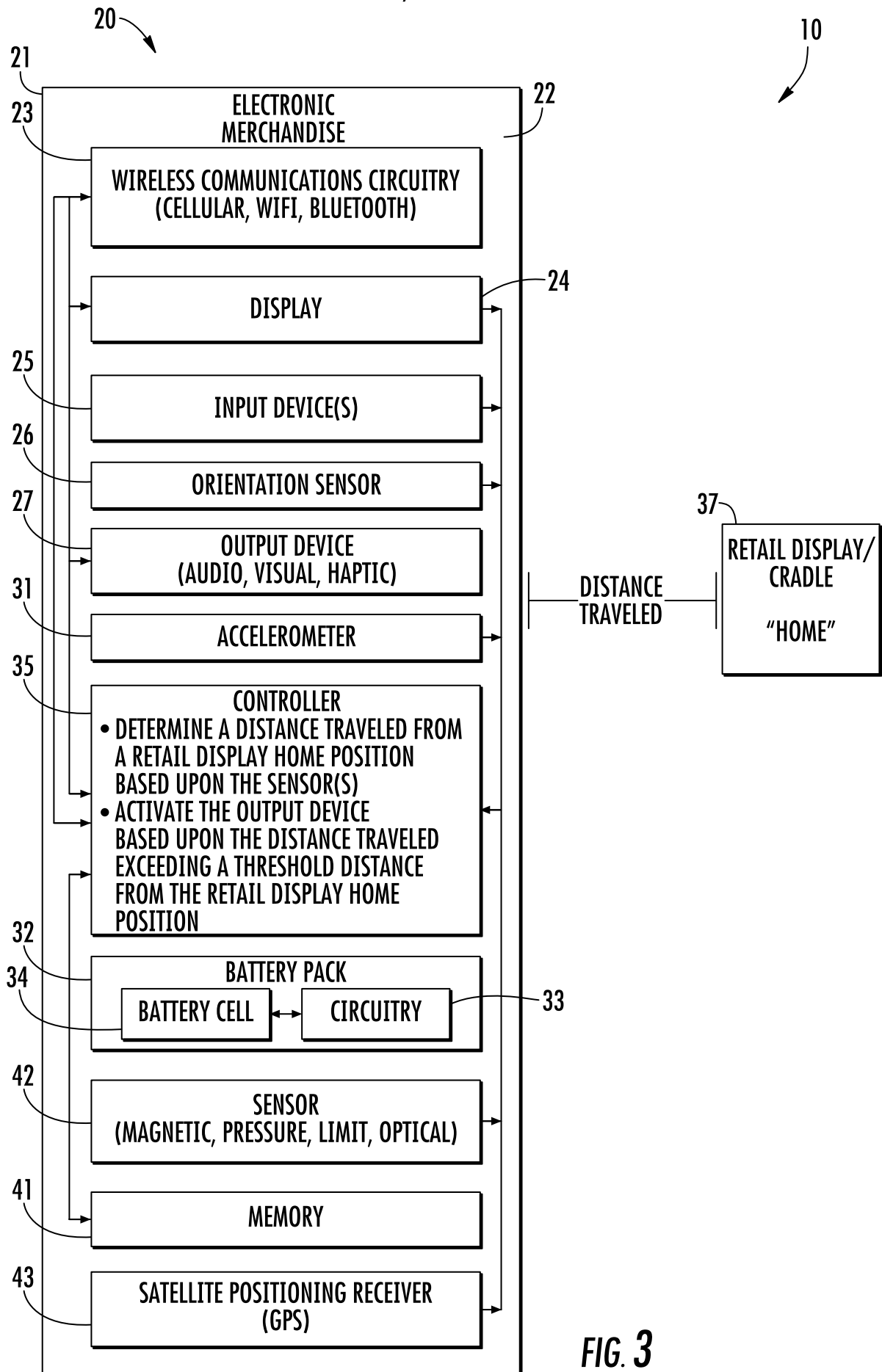


FIG. 3

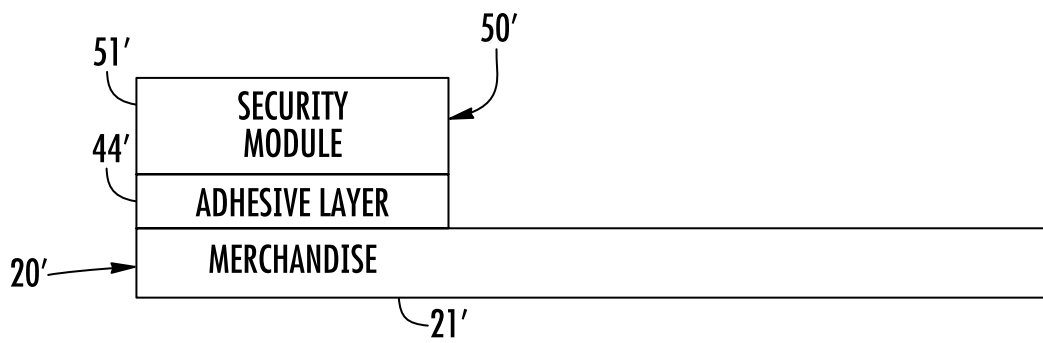
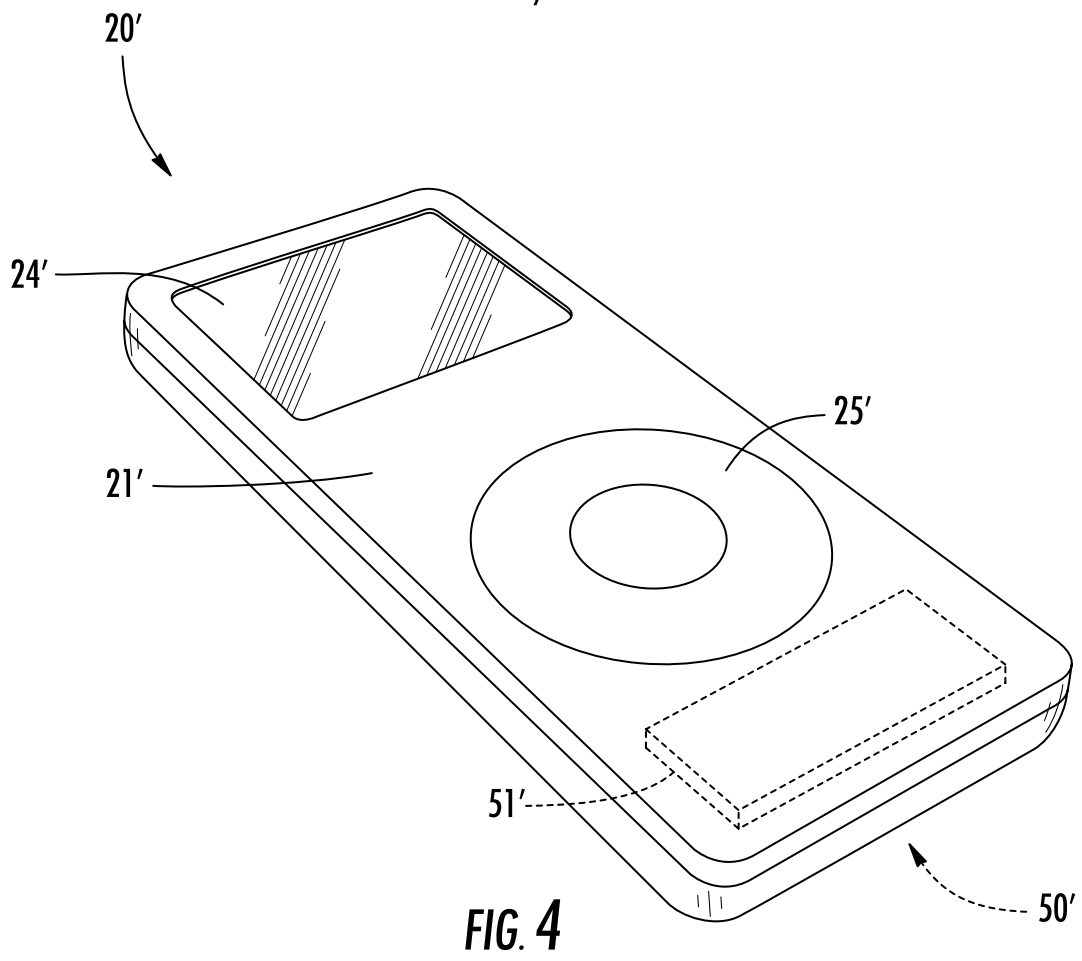


FIG. 5

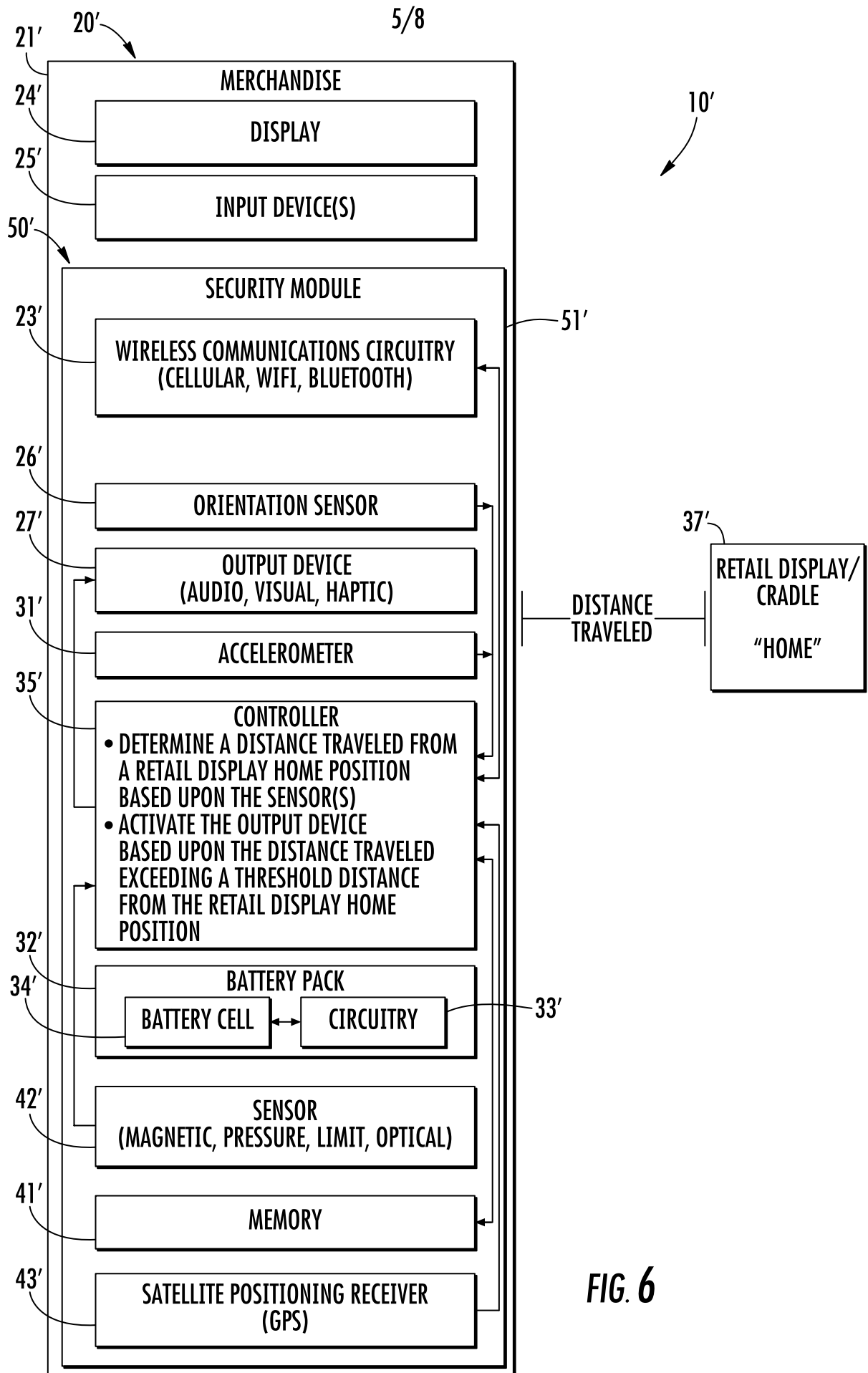


FIG. 6

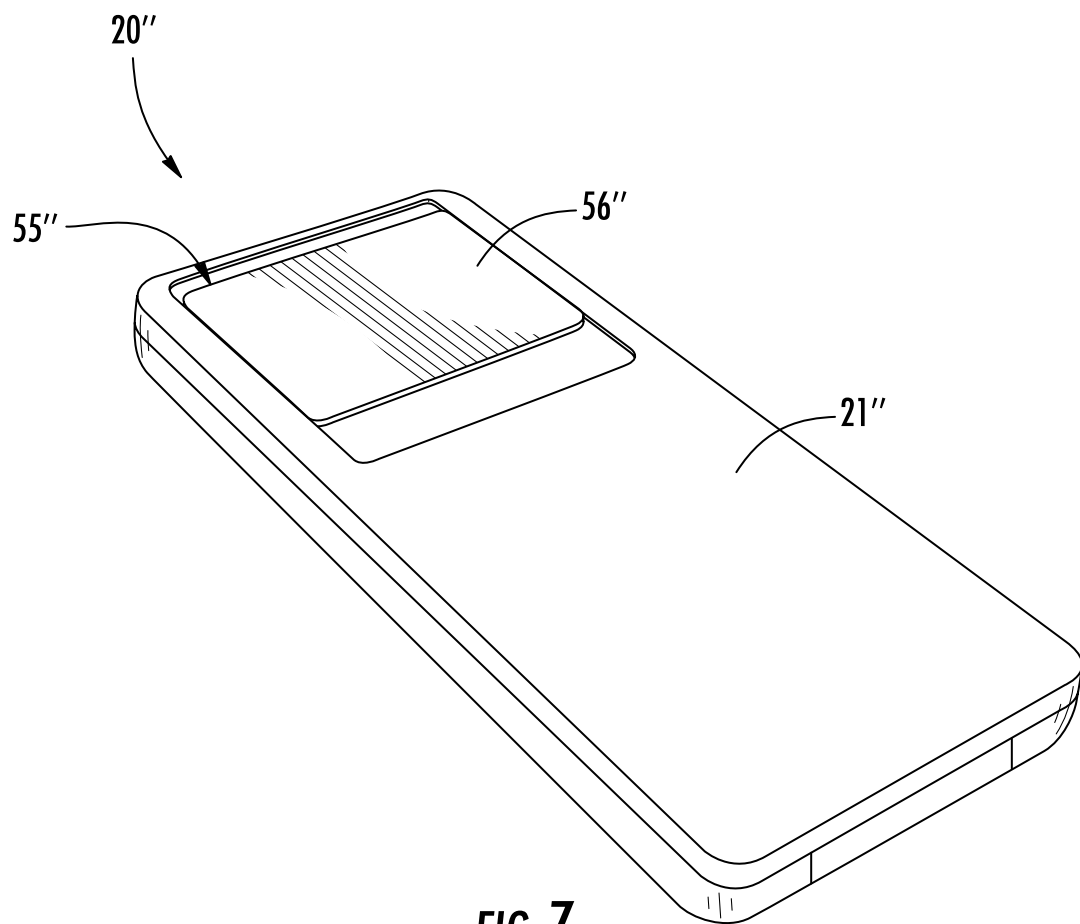


FIG. 7

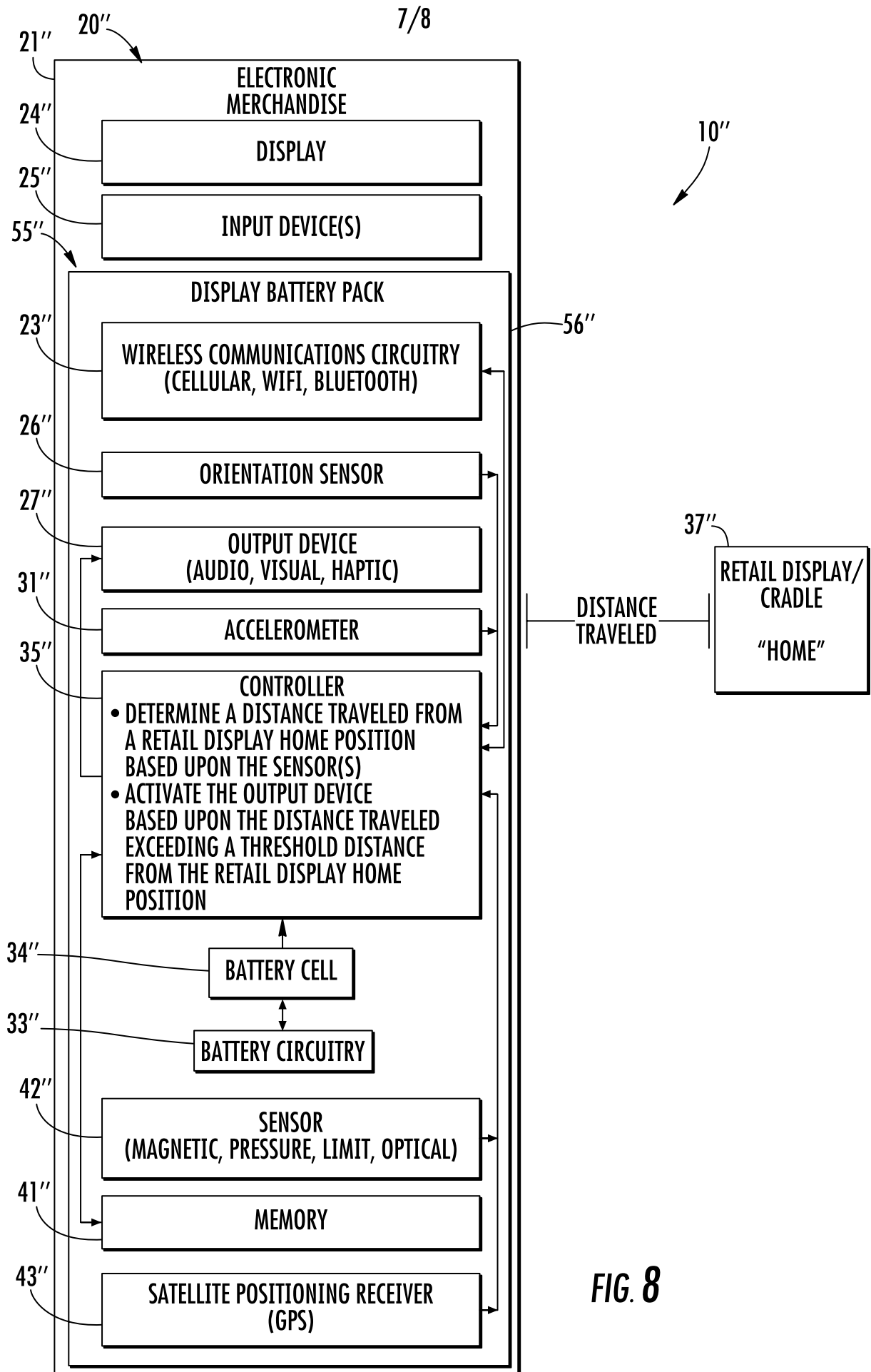


FIG. 8

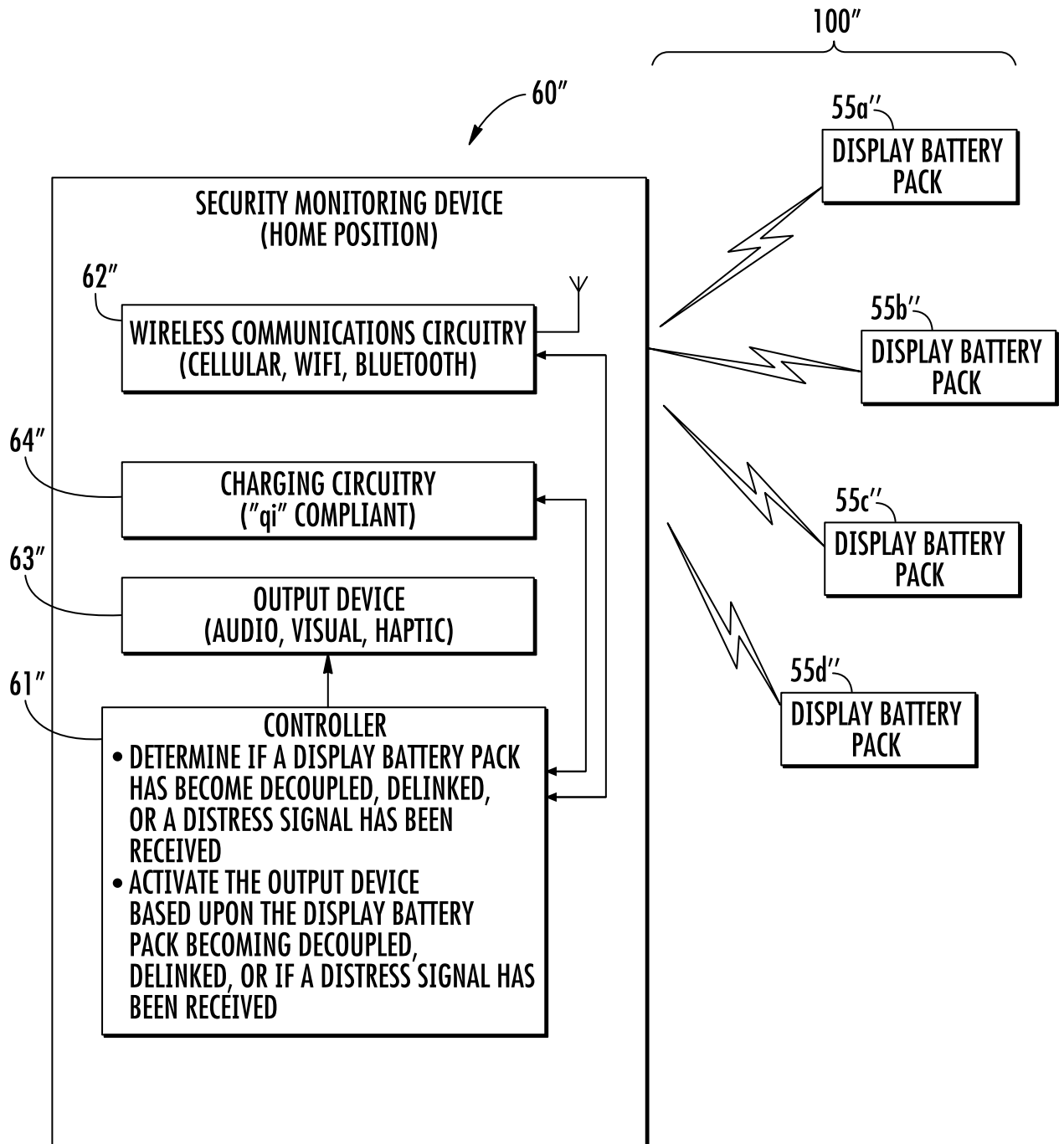


FIG. 9